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| KRAMER LEVIN NAFTALIS & FRANKEL LLP INTELLECTUAL PROPERTY DEPARTMENT 1177 AVENUE OF THE AMERICAS NEW YORK, NY 10036 | | | | VIJAYAKUMAR, KALLAMBELLA M |
| ART UNIT | | PAPER NUMBER | | |
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Please find below and/or attached an Office communication concerning this application or proceeding.

The time period for reply, if any, is set in the attached communication.

Notice of the Office communication was sent electronically on above-indicated "Notification Date" to the following e-mail address(es):

klpatent@kramerlevin.com

| | | |
|------------------------------|--|----------------------------------|
| Office Action Summary | Application No. 10/517,748 | Applicant(s) MA ET AL. |
| | Examiner KALLAMBELLA VIJAYAKUMAR | Art Unit 1793 |

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --
Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133).

Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1) Responsive to communication(s) filed on 23 June 2008.

2a) This action is FINAL. 2b) This action is non-final.

3) Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4) Claim(s) 21-23, 26-28, 30-35, 44, 76-78, 81-82, 84-89 and 97 is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5) Claim(s) _____ is/are allowed.

6) Claim(s) 21-23, 26-28, 30-35, 44, 76-78, 81, 82, 84-89 and 97 is/are rejected.

7) Claim(s) _____ is/are objected to.

8) Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9) The specification is objected to by the Examiner.

10) The drawing(s) filed on _____ is/are: a) accepted or b) objected to by the Examiner.
 Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
 Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11) The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12) Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a) All b) Some * c) None of:
 1. Certified copies of the priority documents have been received.
 2. Certified copies of the priority documents have been received in Application No. _____.
 3. Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) Notice of References Cited (PTO-892)

2) Notice of Draftperson's Patent Drawing Review (PTO-948)

3) Information Disclosure Statement(s) (PTO/SB/08)
 Paper No(s)/Mail Date _____

4) Interview Summary (PTO-413)
 Paper No(s)/Mail Date _____

5) Notice of Informal Patent Application

6) Other: _____

DETAILED ACTION

Applicants arguments filed 06/23/2008 have been fully considered. The finality of last office action is withdrawn in view of the new reference to Zhou et al (US 6,280,697 or US 6,422,450) that addresses the applicants milling and filtration, and places it in a better position for amending by the applicants.

Claims 21-23, 26-28, 30-35, 44, 76-78, 81-82, 84-89 and 97 are currently pending with the application.

Claim Rejections - 35 USC § 102***Claim Rejections - 35 USC § 103***

The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

A person shall be entitled to a patent unless –

- (a) the invention was known or used by others in this country, or patented or described in a printed publication in this or a foreign country, before the invention thereof by the applicant for a patent.
- (b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.
- (e) the invention was described in (1) an application for patent, published under section 122(b), by another filed in the United States before the invention by the applicant for patent or (2) a patent granted on an application for patent by another filed in the United States before the invention by the applicant for patent, except that an international application filed under the treaty defined in section 351(a) shall have the effects for purposes of this subsection of an application filed in the United States only if the international application designated the United States and was published under Article 21(2) of such treaty in the English language.

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

- (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

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The factual inquiries set forth in *Graham v. John Deere Co.*, 383 U.S. 1, 148 USPQ 459 (1966), that are applied for establishing a background for determining obviousness under 35 U.S.C. 103(a) are summarized as follows:

1. Determining the scope and contents of the prior art.
2. Ascertaining the differences between the prior art and the claims at issue.
3. Resolving the level of ordinary skill in the pertinent art.
4. Considering objective evidence present in the application indicating obviousness or nonobviousness.

This application currently names joint inventors. In considering patentability of the claims under 35 U.S.C. 103(a), the examiner presumes that the subject matter of the various claims was commonly owned at the time any inventions covered therein were made absent any evidence to the contrary. Applicant is advised of the obligation under 37 CFR 1.56 to point out the inventor and invention dates of each claim that was not commonly owned at the time a later invention was made in order for the examiner to consider the applicability of 35 U.S.C. 103(c) and potential 35 U.S.C. 102(e), (f) or (g) prior art under 35 U.S.C. 103(a).

1. Claims 44 and 97 are rejected under 35 U.S.C. 102(b) as anticipated by or, in the alternative, under 35 U.S.C. 103(a) as obvious over Shibuta (US 5,853,877).

Shibuta teaches an electrically conductive film and a coating solution for forming the film comprising a dispersion of oxidized Graphitic fibrils/carbon microfibers with a OD of 3.5-70 nm and an aspect ratio of greater than 5 dispersed in a polar solvent (Abstract). The film further contained binder such as cellulose acetate (Cl-11, Claims 3-6). The prior art film is either same or substantially same as that produced by the instant claimed process and When the reference teaches a product that appears to be the same as, or an obvious variant of, the product set forth in a product-by-process claim although produced by a different process, the claim is not patentable. See *In re Marosi*, 710 F.2d 799, 218 USPQ 289 (Fed. Cir. 1983) And *In re Thorpe*, 777 F.2d 695, 227 USPQ 964 (Fed. Cir. 1985). See also MPEP §2113.

2. Claims 44 and 97 are rejected under 35 U.S.C. 102(e) as anticipated by or, in the alternative, under 35 U.S.C. 103(a) as obvious over Glatkowski et al (US 7,118,693).

Glatkowski et al teach the composition of a coating solution, a coated film and making of the coating solution, wherein the composition comprised of a substantially homogeneous dispersion of SWNT

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or MWNT with a diameter of less than 3.5 nm and an aspect ratio of 20-1000 in a polar solvent such as acetone, water, ethers and alcohols or their mixtures, and a binder such as acrylic, polyurethane, silicone and epoxy (Abstract, Cl-8, Ln 63-67; Cl-4, Ln 57-60; Cl-5, Ln 3-5). The nanotubes were oxidized by treatment with oxidizing agents and the aggregates formed ropes that meet the limitation of substantially free of pyrolytically deposited carbon overcoat in the claim-21 (Cl-5, 36-52). The prior art film is either same or substantially same as that produced by the instant claimed process and When the reference teaches a product that appears to be the same as, or an obvious variant of, the product set forth in a product-by-process claim although produced by a different process, the claim is not patentable. See In re Marosi, 710 F.2d 799, 218 USPQ 289 (Fed. Cir. 1983) And In re Thorpe, 777 F.2d 695, 227 USPQ 964 (Fed. Cir. 1985). See also MPEP §2113.

3. Claims 21, 23, 27-28, 30, 33-34, 44, and 76 are rejected under 35 U.S.C. 103(a) as being unpatentable over Zhou et al (US 6,422,450) in view of Haddon et al (US 6,331,262).

Zhou et al teach a method of coating an electrode of a battery by dispersing an allotrope of carbon such as single walled carbon nanotubes in a solvent, and depositing SWNT over a substrate (Abstract). The SWNT had a diameter of 1.3-1.6 nm that formed oriented bundles of 10-40 nm dia, and produced by catalytic methods (Cl-4, Ln 18-24; Cl-7, Claim-1) whereby they will be free of pyrolytic surface carbon due to the catalyst. The SWNT were dispersed in a solvent such as alcohol using an ultrasonic horn and passed through a micro-pore membrane <FILTER>. The SWNT was rinsed with acid before suspending in the solution (fictionalization). The filter passed SWNT was further processed by ball-milling and deposited over the substrate. Suitable solvents were driven off at a temperature of 130-150C under vacuum (Cl-4, Ln 43 - Cl-5, Ln-11; Cl-6, Ln 14-24; 46-65; Cl-7, Claim-6).

The prior art teaches all the method steps in the instant claim-21, but silent about the aspect ratio of the SWNT.

In the analogous art, Haddon teaches solubilizing of SWNT in organic solutions for applications such as batteries, and the SWNT having a length of 1-1000 nm (Abstract, Cl-1, Ln 60-62; Cl-63, Ln 16-18).

The length of the SWNT and its aspect ratio in the dispersion and coatings by Zhou et al would be obvious over the teachings of Haddon et al that teaches an optimum length of 1-1000 nm for the SWNT in battery applications.

With regard to claims 27-28 and 30, the prior art teaches using alcohols and drying between 130-150C under vacuum, and it would have been obvious to a person of ordinary skilled in the art to use alcohols with a boiling point up to 150C, that either touches or overlaps with about 150C in claim-30, and in the case where the claimed ranges "overlap or lie inside ranges disclosed by the prior art" a prima facie case of obviousness exists. In re Wertheim, 541 F.2d 257, 191 USPQ 90 (CCPA 1976); In re Woodruff, 919 F.2d 1575, 16 USPQ2d 1934 (Fed. Cir. 1990).

With regard to claims 33-34, the prior art teaches bundles/aggregates of SWNT.

With regard to claim-44, the prior art teaches a coating whose composition is similar to that produced by the instant claimed method steps, and when the reference teaches a product that appears to be the same as, or an obvious variant of, the product set forth in a product-by-process claim although produced by a different process, the claim is not patentable. See In re Marosi, 710 F.2d 799, 218 USPQ 289 (Fed. Cir. 1983) And In re Thorpe, 777 F.2d 695, 227 USPQ 964 (Fed. Cir. 1985). See also MPEP §2113.

With regard to claim-76 and 23, the claimed method steps would be obvious over the disclosure by Zhou et al that teaches the use of ultrasonic.

4. Claims 31-32 and 35 are rejected under 35 U.S.C. 103(a) as being unpatentable over Zhou et al (US 6,422,450) in view of Haddon et al (US 6,331,262) and Shibuta et al (US 5,853,877).

The disclosure by Zhou et al (US 6,422,450) in view of Haddon et al (US 6,331,262) on the composition and method of making the coating solution/film as set forth in rejection-3 under 35 USC 103 (a) is herein incorporated.

The combined prior art fails to teach the instant claimed fibrils per claims 31-32 and 35.

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In the analogous art, Shibuta teaches coating solutions and film comprising a dispersion of oxidized Graphitic fibrils/carbon microfibers with a OD of 3.5-70 nm and an aspect ratio of greater than 5 dispersed in a polar solvent (Abstract; Cl-9, Ex-1) for application in batteries (Cl-11, Ln 1-3).

It would have been obvious to a person of ordinary skilled in the art to substitute or include fibrils of Shibuta as functional equivalent in the coating composition of Zhou with predictable results and reasonable expectation of success, because the teachings are in the analogous art, and Zhou teaches any carbon allotrope such SWNT could be used, and the prior arts have a common utility in batteries, and Fibrils meet the limitation of MWNT in claim-35.

5. Claims 21-23, 26-28, 30-35, 76-78, 81-82, 84-89 are rejected under 35 U.S.C. 103(a) as being unpatentable over Shibuta et al (US 5,853,877) in view of Zhou et al (US 6,422,450).

Shibuta teaches coating solutions and film comprising a dispersion of oxidized Graphitic fibrils/carbon microfibers with a OD of 3.5-70 nm and an aspect ratio of greater than 5 dispersed in a polar solvent (Abstract; Cl-9, Ln 5-6). Shibuta teaches the fibrils to exist in the form of aggregates/BN and dispersing the fibrils in a medium by milling using mechanical dispersive technology such as ball mill (Cl-3, Ln 26-46), and the dispersed solution being used as a coating solution for forming a conductive film (ink) (Cl-5, Ln 47-50). The making of dispersion further included stirring fibrils in a polar solvent either mechanically or by ultrasonic and with milling (Cl-6, Ln 1-10). The polar solvents included water, alcohols, DMF and DMSO (Cl-5, Ln 54-64). The binders included cellulose acetate and acrylics (Cl -7, Ln 3-10).

The prior art teaches all the limitations of the process steps except filtering the dispersion/ink.

In the analogous art, Zhou et al teach a method of coating an electrode of a battery by dispersing an allotrope of carbon such as single walled carbon nanotubes in a solvent and depositing SWNT over a substrate (Abstract). The SWNT had a diameter of 1.3-1.6 nm and formed oriented bundles of 10-40 nm, and produced by catalytic methods (Cl-4, Ln 18-24; Cl-7, Claim-1) whereby they will be free of pyrolytic surface carbon due to the catalyst. The SWNT were dispersed in a solvent such as alcohol, dispersed in the solvent using an ultrasonic horn and passed through a micro-pore membrane <FILTER>. The SWNT was rinsed with acid before suspending in the solution (fctionalization). The filter passed SWNT was

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further processed by ball-milling and deposited over the substrate. Suitable solvents were driven off at a temperature of 130-150C under vacuum (Cl-4, Ln 43 - Cl-5, Ln-11; Cl-6, Ln 14-24; 46-65; Cl-7, Claim-6).

It would have been obvious to a person of ordinary skilled in the art to filter the dispersions of Shibuta with predictable results, because filtering fibril/SWNT dispersions for battery applications was well known in the art as taught by Zhou et al, and they have common utility as coatings for batteries, and Shibuta further teaches that various modifications to the embodiments are possible (Shibuta: Cl-11, Ln 1-2; 12-15).

6. Claims 21-23, 26-28, 32-35, 76-78, 81-82, and 86-89 are rejected under 35 U.S.C. 103(a) as being unpatentable over Glatkowski et al (US 7,118,693).

The prior art teaches the composition of a coating solution, a coated film and making of the coating solution, wherein the composition comprised of a substantially homogeneous dispersion of SWNT or MWNT with a diameter of less than 3.5 nm and an aspect ratio of 20-1000 in a polar solvent such as acetone, water, ethers and alcohols or their mixtures, and a binder such as acrylic, polyurethane, silicone and epoxy (Abstract, Cl-8, Ln 63-67; Cl-4, Ln 57-60; Cl-5, Ln 3-5). The nanotubes were oxidized by treatment with oxidizing agents and the aggregates formed ropes that meet the limitation of substantially free of pyrolytically deposited carbon overcoat in the claim-21 (Cl-5, 36-52). The composition meets the limitation of conductive ink. The SWNT and MWNT were dispersed in a solvent and mixed with an ultrasonic homogenizer <milling and dispersing>. Applicants disclose the milling to be a process to make the fibril particles more uniform and smaller (Spec. 2005/0224764; P-0125) and ultrasonic with these functions meets the limitation of milling and dispersion of fibrils in the claims. The dispersed nanotubes were separated from the solvent by centrifuging. The supernatant solvent was decanted and the remaining nanotubes were combined with the resin forming the coating solution/dispersion and further casting a film over a substrate (Cl-10, Ln 40-67).

The prior art fails to teach filtering the solution/dispersion per claim-21.

It would have been obvious to a person of ordinary skilled in the art to substitute a filtering means as functional equivalent of centrifuge with predictable results and reasonable expectation of success,

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because they attain the separation of solids and liquids. This further meets the limitation of claims 23 and 76.

With regard to order of performing the steps in claim-22, the prior art teaches all the elements of the process steps, and selection of any order of performing process steps is *prima facie* obvious in the absence of new or unexpected results; *In re Gibson*, 39 F.2d 975, 5 USPQ 230 (CCPA 1930) (Selection of any order of mixing ingredients is *prima facie* obvious.). <MPEP 2144.04>. This further meets the limitation of claims 77 and 78.

With regard to claim 26, the prior art teaches acrylic resins

With regard to claims 27 and 81, the prior art teaches alcohols.

With regard to claims 28 and 82, the prior art teaches water.

With regard to claims 32-35 and 86-89, the prior art teaches oxidized MWNT and SWNT and ropes of SWNT.

7. Claims 30 and 84 are rejected under 35 U.S.C. 103(a) as being unpatentable over Glatkowski et al (US 7,118,693) in view of Shibuta et al (US 5,908,585).

The disclosure by Glatkowski on the composition and method of making the coating solution as set forth in rejection-3 under 35 USC 103 (a) is herein incorporated.

The prior art fails to teach the instant claimed solvents per claims 30 and 84.

In the analogous art, Shibuta teaches coating solutions for forming conductive film comprising a dispersion of Graphitic fibrils/carbon microfibers with a OD of 3.5-70 nm and an aspect ratio of greater than 5 dispersed in a polar solvent such a cellosolve and ethoxy ethanol, and a binder such as acrylic resins, urethane and epoxy (Abstract; Cl-3, Ln 29-44; Cl-5, Ln 26-35; Cl-6, Ln 7-36).

It would have been obvious to a person of ordinary skilled in the art to substitute or include cellosolve and/or ethoxy ethanol of Shibuta as functional equivalent in the coating composition of Glatkowski with predictable results and reasonable expectation of success, because the teachings are in the analogous art and Glatkowski teaches the addition of ether and ester solvents in the composition.

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8. Claims 31 and 85 are rejected under 35 U.S.C. 103(a) as being unpatentable over Glatkowski et al (US 7,118,693) in view of Shibuta et al (US 5,853,877).

The disclosure by Glatkowski on the composition and method of making the coating solution as set forth in rejection-1 under 35 USC 103 (a) is herein incorporated.

The prior art fails to teach the instant claimed fibrils per claims 31 and 85.

In the analogous art, Shibuta teaches coating solutions and film comprising a dispersion of oxidized Graphitic fibrils/carbon microfibers with a OD of 3.5-70 nm and an aspect ratio of greater than 5 dispersed in a polar solvent (Abstract).

It would have been obvious to a person of ordinary skilled in the art to substitute or include fibrils of Shibuta as functional equivalent in the coating composition of Glatkowski with predictable results and reasonable expectation of success, because the teachings are in the analogous art and Glatkowski teaches dispersion of CNT in polar solvents, and Similarly, a *prima facie* case of obviousness exists where the claimed ranges and prior art ranges do not overlap but are close enough that one skilled in the art would have expected them to have the same properties. *Titanium Metals Corp. of America v. Banner*, 778 F.2d 775, 227 USPQ 773 (Fed. Cir. 1985) (Court held as proper a rejection of a claim directed to an alloy of "having 0.8% nickel, 0.3% molybdenum, up to 0.1% iron, balance titanium" as obvious over a reference disclosing alloys of 0.75% nickel, 0.25% molybdenum, balance titanium and 0.94% nickel, 0.31% molybdenum, balance titanium.).

Response to Arguments

Applicant's arguments filed 06/23/2008 have been fully considered but they are not persuasive.

In response to the argument that, Glatkowski teaches dispersing with ultrasonic and does not teach or suggest specific "milling," and Indeed, Applicants' claims 21 and 23 and teachings at p. 23, lines 13-p. 24, line 2 confirm that sonication and milling are two different steps (Res, Pg-6; Para-2); applicants disclose milling to disperse the fibrils and to make the fibril particles more uniform and smaller (i.e. cut) that could be done in a three roll mill or other conventional milling machine can be used (Spec. 2005/0224764; P-0125), which encompasses even mixing the components in a beaker using a glass rod.

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Further applicants disclose ultrasonic to improve the dispersion of fibrils (P 0156, Fig-7) and does not establish the critical need for milling in making the ink. Ultrasonic clearly disperses and cuts the nanotubes as taught by Smalley et al (US 7,108441; Cl-16, Ln, 45-65) which is within the scope of applicants disclosure of milling, that meets the limitation of milling and dispersing in the claims, and during examination, the claims must be interpreted as broadly as their terms reasonably allow. In re American Academy of Science Tech Center, 367 F.3d 1359, 1369, 70 USPQ2d 1827, 1834 (Fed. Cir. 2004) <MPEP 2111.01[5]>. Further new rejections that include a step of milling are cited above.

In response to the argument that no evidence or art to support that "it would have been obvious to a person of ordinary skilled in the art to substitute a filtering means as a functional equivalent of centrifuge" was provided (Res, Pg-3, Para-2), the substitution of centrifuging by filtration or vice versa is well known to a person of ordinary skilled in the art at the time of the disclosure of the invention by the applicants as taught by Tennet et al (US 6,099,965; Cl-25, Ln 11-15) that clearly establishes functional equivalency between the two unit operations in the treating fibril containing dispersions.

For the reasons set forth above, applicants fail to patentably distinguish their process over prior art.

Conclusion

Any inquiry concerning this communication or earlier communications from the examiner should be directed to KALLAMBELLA VIJAYAKUMAR whose telephone number is (571)272-1324. The examiner can normally be reached on M-F 07-3.30.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Stanley Silverman can be reached on 5712721358. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

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Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

/KMW/
July 19, 2008.

/Stanley Silverman/

Supervisory Patent Examiner, Art Unit 1793